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ABSTRACT

The purpose of this project is to investigate the potential of communication networks using electronic mail, computer conferencing, and electronic databases for education and training at a distance within the Open Univeristy system of Great Britain, although it would be applicable within other contexts. This report discusses (1) the rationale for the project; (2) the technical requirements for implementing a system; (3) some advantages and disadvantages of computer conferencing; (4) factors to be considered in deciding which types of courses might benefit most; (5) a planned program of work for the project; (6) the principal phases of the proposed project; and (7) how electronic text technologies may be used on a wider context. Seventeen references are listed. (DJR)

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THE OPEN UNIVERSITY

Project Report CCET/1

COMPUTER CONFERENCING FOR EDUCATION AND TRAINING

PROJECT DESCRIPTION

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This report has been prepared from an earlier draft, with the valuable help of comments from Tony Bates (IET) and Paul Bacsich (Faculty of Technology)

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COMPUTER CONFERENCING FOR EDUCATION AND TRAINING: PROJECT DESCRIPTION

AIMS

The overall purpose of this project is to investigate the potential of communication networks using electronic mail, computer conferencing, and electronic data-bases for education and training. The expression "computer conferencing" is used in this paper as a generic term to refer to all three of these text communication facilities. The project is specifically concerned with education and training at a distance within the Open University system, although the lessons to be drawn from it would be applicable within other contexts (eg to campus-based institutions with computer network facilities).

RATIONALE

To date, the main thrust in applications of information technology to distance education has been in the areas of computer assisted and computer managed learning (CAL and CML). Much of this work is concerned with explicating and testing acquisition of specific concepts, bodies of knowledge, or skills, through tutorial CAL, simulations, or modelling exercises. Such applications permit greater "individualisation" of instruction, allowing learners to monitor their own progress, to detect errors in understanding, to be programmed through remedial routines, and to proceed at their own pace. But the development of high quality CAL software is an extremely time-consuming and difficult process, and applications have generally been limited to a small number number of specialist discipline areas in mathematics, science, technology, psychology, and geography (see, for example, Jones, 1984).

A justification often made for introducing CAL material into distance education courses is that this will reduce the student's isolation - for example , by simulation of the dialogue that a student might hold with a tutor. In fact,of course, such simulations do not reduce the learner's isolation at all, nor are they true dialogues. Interaction with a piece of software on a diskette in a micro-computer, or on a remote mainframe computer, is no substitute for the interaction and group work that is possible with actual people, because the interaction is within restricted boundaries which cannot be altered by the learner. In a conventional educational or training environment, interaction with colleagues and tutors, with the learners able to set their own boundaries for dicussion, is a key element. In a distance education setting, however, it is a rare luxury, involving travel to occasional tutorial meetings, inconvenient short residential schools, or occasional telephone conferences. Hence the importance attached to written correspondence between students and tutors, but such interaction has obvious limitations in terms of response time and convenience, and is not appropriate for group communications.

In any case, the mediation of much distance teaching through mass-produced self-instructional texts and audiovisual materials does not permit much dialogue between learners and teachers. It thus becomes difficult for a student to negotiate his or her own personal programme of study, or to internalise significant understandings through a process of "conversational learning". The fact that the tutors with whom distance learners do have contact generally act as intermediaries, and have often not been involved in developing the course, only amplifies the problem.

Another drawback of many distance education systems is related to the economies of scale permissible through the use of mass-produced and high quality course components, whether they are print, audiovisual, or computer software materials. To recoup the investment in the large amounts of time and money necessary for their development, it is usual practice to repeat distance courses over a five to eight year period, or even longer. During this "course life", it is generally impossible (for cost and other reasons) to make anything but minor changes to the course materials, regardless of user feedback or of new developments in subject-matter.

To summarise, current distance education methods suffer from a number of drawbacks which can, in certain cases, drastically reduce the quality of the education or training provided. These drawbacks include:
- the limited opportunities for dialogue and group interactions
- the relative inflexibility of many distance courses in terms of being able to respond to individual needs, interests and experiences
- the high cost of up-dating and modifying mass-produced print and audiovisual course materials.

While realising the relatively intractable nature of these problems, we think that some of the new, but now relatively well tested, communications technologies can greatly improve distance education practice. Techniques such as electronic messaging and computer conferencing within student/tutor networks can use the power of the computer to foster conversational learning, socialinteraction, and conviviality (Lamy,1985) rather than to encourage the individualisation that is stressed in many CAL applications. Small and easily accessible data bases to which tutors, course developers, and learners could contribute might be a useful adjunct to mass produced course materials, permitting up-dating and revision at minimum cost.

These communications technologies could also represent valuable tools for adapting distance course design more effectively to the special needs of adult learners. Distance education projects tend to attract highly motivated people with relevant personal and professional knowledge, experience, and insights to contribute to the course of study or training which they are following. Knowles (1970) has summarised the main characteristics of such adult learners as increasing self-direction, the acquisition of a resevoir of experience that can become a resource for learning, a readiness to learn linked to the tasks associated with social roles, and a problem-centred rather than a subject-centred orientation. It can at times be difficult to reconcile these features of the adult learner with a distance education system based on one-way transmission of information, however attractively presented, from a central source to a population of dispersed and isolated learners. This is particularly the case in areas such as professional development or post-graduate training, where, in a traditional teaching situation, seminars and discussion groups would play a key role.

Computer conferencing could stimulate new forms of course design, enabling students to use their own experience as a learning resource , to work together creatively in groups, and to maintain continuing dialogues with tutors and course developers. The combination of the resulting learning networks with the best features of existing practice may well lead to some of the most fruitful new developments in this field.

TEACHING WITH COMPUTER CONFERENCING

The basic **technical requirements** for implementing a computer conferencing system for Open University use are threefold:
- a mainframe computer with suitable software (in the OU case the ACS DEC 20's with the existing MM electronic mail software would be suitable for initial trials)
- access to a communications network capable of linking remote users to the mainframe computer at local call rates (the great majority of OU students will have the potential for such access from their homes in 1986)
- a suitable terminal for each student and tutor; the minimum requirements are a micro-computer (eg a BBC model B, Sinclair QL or a HEKTOR) with a terminal emulation chip, a monochrome monitor, a 1200/75 baud modem, and a BT603 jack socket telephone connection. For some applications (eg for composing and keeping copies of draft assignments, or for downloading text from a data-base), an inexpensive printer and a disc drive would be necessary.

With computer conferencing software on the mainframe computer, the above configuration can provide a number of text communication facilities based on a "store and collect" principle, i.e. messages typed in from students and tutors will be stored on the mainframe computer from where they can be "collected" by their intended recipients. This is the basic principle of an electronic mail system, which allows for messages to be sent to:
- one's own personal, confidential, file
- another person's electronic mailbox
- a group of named people, through each one's mailbox
- a topic-based bulletin board, to which entry may be relatively restricted (eg a particular tutor group) or open to all (eg all tutors and students on course X) ; once "messages start flying thick and fast on the topic you have made yourself a computer conference" (Bacsich, 1985).

As well as the reading and sending of messages, basic facilities also include confirmation of message receipt, and editing, filing, and scanning of messages. The last feature is particularly important , permitting users to ask to see, for example, all messages mentioning a paticular named topic, or sent by a named individual, or since a particular date. More sophisticated facilities available on some computer conferencing packages include indexing, the possibility of conducting voting, opinion polling,or multiple-choice testing, and the assigning of specialist roles (chairman, secretary etc) to participants in a conference or meeting.

Communication in a computer conferencing system is generally asynchronous (this being one of its major advantages over telephone conferencing), thus allowing despatch and collection of messages at times suitable to each individual, and permitting time for reflection before responding to a message. Another major advantage over other types of tele-conferencing is, of course, that all messages sent are retained in the mainframe computer files until deliberately edited or deleted, so a permanent cumulative record of a computer conferencing seminar, for example, is available to all participants.

A number of obvious applications of computer conferencing for distance education courses can, theoretically, be envisaged:
- handling of queries from students to their counsellors or tutors on matters such as course choice, study guidance, and problems of

comprehension of course materials
- submission of draft homework assignments to a tutor for comments and formative evaluation before the final version is prepared
- negotiation of project topics and outlines between student and tutor
- group tutorials and seminars
- self-help groups and special interest groups exchanging comments and guidance on particular topics
- periodic self-test quizzes prepared by a tutor for his or her group of students
- access to course up-dating material, stop-press announcements, and other messages from the central course team for which print distribution would be too slow or uneconomic
- use of bulletin boards as small data-bases on course topics, to which tutors and course staff could input information (eg abstracts of new publications, resumes of recent research etc).

Some of these applications would represent a substitute for existing postal, telephone, or face-to-face communication channels, but this would not neccessarily lead to a reduction in the use of these other channels (except perhaps for postal communication). Evidence suggests that computer conferencing can lead to an increased desire for telephone and face-to-face contact, but that the nature and function of the communication changes (Bloch, 1983). It is also clear that computer conferencing is more than a substitue for face-to-face or written communication, and is itself a unique communication medium with its own special characteristics (Vallée et al, 1975; Palme, 1982). However, too little is known about the potential of computer conferencing in education, particularly as a component of distance education courses, to be able to generalise at this stage. Undoubtedly, with experience on different types of course, and different groups of students and tutors, new uses and communication patterns will arise which we cannot now anticipate.

In the Open University context, there are a number of important factors to consider in deciding which types of course might benefit most from a computer conferencing facility. Cost and course population numbers are important practical criteria: it would be out of the question to use computer conferencing on Foundation courses with populations of 5,000 - 6,000 students and several hundred tutors each year. In any case, the OU system works well at the moment for teaching foundation and second-level courses. It uses a relatively directive approach, with professionally prepared and tested course materials, aimed at communicating well-defined and structured bodies of knowledge and skills to potentially large numbers of students. The tutorial system generally functions effectively on such courses, even when student numbers and distributions are such that occasional day schools have to be substituted for more frequent evening tutorials. Postal and telephone contact proves adequate, on the whole, for dealing with learning problems and for assignment work. In such cases, it would only be justifiable to introduce computer conferencing as "value-added" tutorial tool on courses which already require students to have the necessary equipment at home (eg courses in computing, software engineering, etc).

However, it is in the area of specialist and advanced level courses (some third and fourth level undergraduate courses, post-graduate courses and diplomas, and professional development courses) that the OU system currently tends to be less effective. Course populations are

often fairly low in these areas, the subject-matter tends to need frequent up-dating, and suitable tutors, other than course development staff, may be more difficult to identify. Furthermore, such courses often aim to attract students with a store of relevant existing knowledge and experience to contribute. The standard one-way pattern typical of many OU courses gives little scope for such a contribution, with the exception of some project-based courses (see, for example, Bynner and Henry, 1984). We think that computer conferencing could be an important vehicle for incorporating the features of a typical post-graduate seminar into advanced level courses, allowing .."instructor and students to read advanced materials, discuss their strengths and weaknesses, explore new ideas, and , in general, dialogue with one another" (Davie and palmer, 1984).

It would thus seem appropriate in the first instance to use computer conferencing for advanced level courses with relatively small numbers of students spread throughout the country, especially courses where students are expected to do a good deal of personal research or project work. On such a course, tutors might be drawn from central course team staff, supplemented by a few external tutors covering specialist areas. The tutors would work within an agreed broad content outline, but would negotiate personal work programmes and project outlines individually with each student . Draft or finalised versions of individual students' work could be made available to others for comment, and joint texts could even be produced using the computer conferencing software.

Because each communication is stored on the mainframe computer, tutors and students could call up information as and when necessary and convenient. The current minimum 10 day delay on return of postal written comments from a tutor could be reduced to a few hours or less. Thus the teaching would be asynchronous (since student and tutor do not have to be in communication at the same time) but on-line.

Bulletin boards could be used for seminars on specific course topics, each under the guidance of a specialist tutor, as well as for data-bases to which tutors and course development staff would contribute. The latter might include up-to-date bibliographic references and abstracts, local resources, summaries of students' own project work, and even some core course material in certain cases. However, centrally produced print materials and course readers would continue to provide a principal vehicle for basic core material in many instances.

In a distance education context, the **advantages** of using computer conferencing in the ways we have described above can be summarised as follows:

- it permits an extension of "real-time" conventional teaching, allowing tutors to respond quickly and sensitively to students' queries as and when they arise, but at a distance and at times chosen by each as being convenient
- it could help reduce "front-end" costs: academic staff would spend less time at the OU in preparing materials, and more time tutoring, thus bringing them into closer contact with students
- it permits enhanced individualisation of teaching , with much greater scope for personal negotiation of each student's work and project topics
- it could permit a faster response by the University to requests for new courses, based on the use of outside experts (eg from commerce or industry) as "electronic tutors"

However, it would be absurd to ignore the serious **drawbacks** to using computer conferencing for Open University students. These include:
- the costs of providing equipment to students and tutors, whether borne partially or completely by the University; a policy which transferred costs to students by requiring them to provide their own equipment would price out many of the people for whom the University was intended
- the impossibility, at the present time at least, of implementing computer conferencing across a wide range of courses, or on large population courses
- the development of adequate user training materials, and of sufficiently "user friendly" interfaces with students and tutors, as well as the overcoming of any residual resistances to using keyboards to communicate.

One of the main objectives of this project will be to obtain the necessary experience within the OU system of the relative balance of advantage and disadvantage in using computer conferencing for educational functions.

PROGRAMME OF WORK

The planned programme of work is built around a product development model. It is proposed to develop and try out new models of distance course design based on the use of computer conferencing as an integral and key component of the learning system.

The project will encourage selected course teams to implement computer conferencing, and then monitor user reactions to different applications. Informal discussions are currently underway with a number of staff, in both the Faculties and in the Continuing Education Division, concerning the selection of specific courses for initial trials. In the first instance, trials would probably be limited to a few selected tutorial groups on courses which already use micro-computers, and to one or two low population fourth level or post-graduate courses where funds might be obtained for loaning of the necessary equipment to tutors and students .

Research would concentrate on three principal aspects of the user interface with the communications system on these courses.

Firstly, there would be continual monitoring and analysis of the technical characteristics of the equipment and software configurations and of the communications links between user terminals, the mainframe computer, and the equipment used to provide data-base input. This would concentrate on issues such as speed and reliability of response, especially within the context of all the other demands made on the University's mainframe computing facilities.

The second, and principal element, of the research concerns user reactions to the system - namely the reactions of students, of home-based tutors, and of campus-based tutors/course developers, and the nature of the interactions beteen these three categories of user. A number of important aspects can be distinguished :

(i) the identification and elimination of problems in learning to use the system; it is extremely important, for example, that logging-in

procedures be made as simple as possible , that messages can be sent with ease, and that access to mailboxes and data-bases be as straightforward as possible

(ii) the analysis of the special features of instructional interaction through electronic message systems. Although there is now a fair amount of published material in the areas of office work and home-based information systems (see, for example, Christie 1981; Hiltz and Turoff, 1978; Johansen et al, 1979), little work has been carried out to date on applications to education and training. We would want to follow up some of the initial findings reported by Quinn et al (1983), which contrasted face-to-face discussion with interactions through an electronic network in a college level class. Their findings concerning interaction in a non-real time message system demonstrated "multiple threads of discourse", a higher proportion of student turns to teacher turns, and other deviations from the "initiation-response- evaluation" sequences usually found in face-to-face classroom interactions. We would wish to compare interaction patterns with those already analysed for face-to-face tutorials , audiographic tutorials, and written and telephone interaction in the Open University system (see, for example, Murgatroyd, 1980; Robinson, 1984; McConnell, 1984). In this context, it will be important to consider both planned interactions (eg seminars, tutorials, and other features incorporated into the course design), and unanticipated uses of the message system by students and tutors.

(iii) preferences between different forms of communication would be analysed,and for this reason we would wish to maintain written postal and telephone communication channels on the courses being monitored, to be able to see which channels were chosen for which instructional and counselling functions. Hopefully, it may be possible to relate individual differences in preferences for different forms of group communication, and different modes of use of electronic text communications, to differences in cognitive styles (see, for example, Ausburn and Ausburn, 1978).

The third, and final principal area for investigation concerns resource issues. Introduction of electronic text communications into an existing distance teaching organisation, or the establishment of new projects designed around these technologies, will necessarily require changes in working methods for course developers, tutors, and administrative and support staff. Similarly, cost functions for course development and course presentation and maintenance will differ from present ones. The project would hope to be able to identify both changes in working methods, and costs of development and use of these new technologies, so as to be able to draw conclusions concerning the organisational requirements that must be met for their succesful use in a distance education context.

PROJECT PHASES

The principal phases of the proposed project are as follows:

(i) identification of one or more courses in which trials of computer conferencing and related techniques can be carried out: these might range from an optional add-on facility with a chosen tutor group on a course already using micro-computers, to a course where computer conferencing is a central and essential feature of the design

(ii) identification and procurement of suitable equipment for home

terminals and for central input functions; although it is important that all students and tutors have the same micro-computers on a given course, this does not prevent having one course using, say, a Sinclair QL, another a BBC, and a third a HEKTOR

(iii) running of on-campus trials and simulations of different uses for computer conferencing amongst members of the project group, and development of user training material

(iv) software development; in the first instance, and until users start to demand more sophisticated software, use would be made of the MM system already available through ACS - this has electronic mail and bulletin board facilities, as well as free text retrieval and a range of other tools; however, we would want to explore the possibilities for improving this software, notably by adding graphics communication facilities

(v) development of detailed research and evaluation design, preparation of research tools, and identification of students and tutors

(vi) implementation of the chosen courses, and evaluation and monitoring of use of the electronic text communication facilities over a one year period on each course; the intention would be to stagger the first years of presentation, moving from relatively simple applications in the first course, to more sophisticated ones in later courses (ie an incremental approach).

(vii) preparation of a final project report containing recommendations for future developments of computer conferencing and related technologies in the OU system.

It is planned to start work on the project in May 1985, and the intention would be to have phases (i) - (iii) well advanced by the end of this year, with the hope of being able to start small-scale trials on one course in 1986. More extensive trials on two or more further courses would be planned for 1987 and 1988, with production of the final project report [phase (vii)] in 1988/89. Evidently, the execution of a programme to this timetable depends on the necessary resources being obtained to develop implementations on specific courses. External sponsorship from manufacturers of suitable equipment,and, for example, from British Telecom, will be actively sought.

A core project team is now being established, drawn from the Institute of Educational Technology and the Faculty of Technology (see Annexe for details). Each member of this core group will be equipped with a terminal linked to the ACS network to enable them to carry out simulations of educational applications of computer conferencing . This group would be responsible for identifying and briefing interested course teams, providing information, and helping to set up and evaluate trials. It is expected that other members will join this group from the course teams involved in computer conferencing trials. In addition, a circulation list of OU staff members wishing to keep abreast of developments in this field will be drawn up, and relevant information on current work mailed to them.

THE WIDER CONTEXT

It is only recently that attempts have been made to apply electronic text communication technologies to education and training. Successful uses of computer conferencing as a teaching and learning tool have been rare, even in North America, where this facility has existed on time sharing computer systems for some time (Bacsich, 1985).

The few applications reported have generally been in a traditional educational context, oriented more towards providing information and learning software to schools and colleges, rather than communication links between dispersed tutors and learners. The "Télémédiathèque" project in Southwestern France, for example, initiated in 1982, links together schools in the Region with a central Documentation and Research centre in Bordeaux, through a videotex network. Facilities on the network include a newsletter, an electronic message system, access to a data-base of teaching documents which can be reserved and ordered by individual teachers, and computer games and learning software for direct use by children on the terminals . Similar facilities will be provided in Britain by Prestel's education network and by the Times Network for Schools.

In higher education, most recent applications have been in the United States and Canada . Much of this work concentrates on use of videotex - eg Telidon applications in Canada - and with a few exceptions (the University of Wisconsin, Québec's Télé-Université) does not originate from institutions with significant experience in distance education methods. As far as computer conferencing is concerned, much of the North American experience has concentrated on use of on-campus networks, and does not directly concern the typical home-based adult studying at a distance. The few projects intended for the home-based learner are relatively recent (eg New York Institute of Technology's "On-Line College", the California-based "Electronic University"), or are in their planning stages (eg at the Open learning Institute in Vancouver).

The project would maintain its existing contacts, and develop new ones, with experiments in using computer conferencing and other electronic text communication technologies going on elsewhere. Some of these contacts may well develop into collaborative research studies, thus ensuring that the limited experience in this field is shared, and that applications in the OU system will benefit from experience in other institutions. Two potential joint studies are currently under consideration, one for development of "intelligent" computer conferencing software, and one for a comparative international study of educational applications of computer conferencing.

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ANNEXE: PROJECT STAFFING

The initial impetus for establishing the project and trying to involve a number of course teams in eventual trials has arisen from discussions over a period of several months between Paul Bacsich (Technology), Tony Bates(IET) and Tony Kaye (IET). Each intend to continue their involvement in this work over the next three years, given the necessary time, and in the light of other commitments.

Other people who have expressed an interest and a willingness to commit time to the project as core members include:

- Mary Thorpe (IET)
- Jane Henry (IET)
- Dave McConnell (IET)
- Ann Jones (IET)

While those elements of the proposed research and development work to be undertaken by IET staff would be based primarily in the Information Technology Programme within IET, the applications cut across all three of the Institute's programme areas and it is important that a mechanism be found for involving interested members of the Course Innovations Programme and the Student Learning Programme in the work.

Each core project member needs to be equipped with office lines to the ACS network and suitable terminals (eg a HEKTOR or BBC model B with a Newbury terminal emulation chip), where this has not already been done.